

# The Production of Orienteering Maps in Austria

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**Abstract.** Due to changing technologies in collecting data, the production of orienteering maps has changed in the last few years. The use of ortho-photo images combined with Airborne Laser Scanning data as well as new hardware and software reduces the time and the costs of the production of orienteering maps. This article will present the current situation of orienteering maps and map making in Austria.

**Keywords:** Orienteering maps, OCAD, Data Acquisition

## 1. Introduction

The production of orienteering maps has changed in the last two decades, the development of the orienteering software OCAD had shortened the time significant. Not only the production itself is getting faster, even the time of surveying a map can be reduced (Guldimann 2012). The use of GPS can be taken for granted nowadays, which is completely supported since OCAD 9. It is possible to import GPX-files and to assign symbols automatically to waypoints and tracks. Real Time GPS can be used since OCAD 10 on a Tablet PC together with a GPS device, as shown in *Figure 1*. Since OCAD 11 a Laser Distance Meter (Gloor 2013) can also be connected within the program to easily survey a wider area.

With OCAD it is also possible to import geo-data from Geographic Information Systems as SHP or DXF formats. Since Digital Elevation Model-Data even from Airborne Laser Scanning (Gartner et. al. 2007, Gartner et. al. 2009) are affordable, the use within OCAD to derive contour lines offer new possibilities in making orienteering maps. The main focus of attention is therefore the data acquisition, which will be more and more important for the future. This article will present the current situation in Austria. It will be shown where data can be bought, what costs have to be calculated and which data can be used for free. Another important aspect will be the data quality expected for the used data.



**Figure 1.** Real Time GPS of OCAD on a Tablet PC (Guldimann 2012)

## **2. Orienteering Maps in Austria**

The number of orienteering maps produced in Austria is approximately constant each year as shown in *Table 1*. Only the different kind of maps are differing, A indicates standard orienteering maps, B regional orienteering maps, C orienteering maps for schools, D reports the number of MTBO and Ski Orienteering maps and E maps only for MTB Orienteering.

	A	B	C	D	E	Total
2008	4	11	28	8	3	54
2009	8	15	25	11	6	65
2010	9	11	14	13	3	50
2011	11	14	16	5	7	53
2012	13	4	20	7	9	53

**Table 1.** Number of Orienteering Maps produced in Austria (ÖFOL Map Commission 2013).

It was not completely ascertainable for the author what kind of data have been used for producing these maps, but as the author knows from many discussions with club members in Austria, many of them have used Airborne Laser Scanning data. One reason for this are the decreasing costs of the data.

### 3. Data Acquisition in Austria

Data acquisition in Austria is not that easy, because Austria has 9 provinces and each province administration is responsible for the surveying, the updating, the distribution and the pricing policy of the geo-data. Besides the Federal Office of Metrology and Surveying has the national mandate for making topographic maps in Austria and therefore this governmental organisation has their own data, which can be bought. The Agricultural, Forestry and Hydrological Data Center (LFRZ), another governmental organisation, as well as some of the cities and municipalities offer also geo-data.

The “Cooperation Open Government Data Austria” (OGD 2013), founded in 2011, established a framework with standards compatible to INSPIRE to publish data from the federal government, the provinces, cities and municipalities for the public for free. These geo-data are provided amongst others in SHP, GML or KML format or as WMTS, WMS or WFS services.

The following compilations will give a short overview of data that can be used for producing orienteering maps, where they can be ordered and what costs have to be calculated. Most of the data as well as WMS services can be used geo-referenced directly in OCAD or GIS-programs like ArcGIS or QGIS, WMTS services can be loaded in ArcGIS (only in version 10.1 or higher) and WFS services are available in QGIS.

### 3.1. Atlas Portals

Each province has an internet atlas portal, where different data layers can be explored. These data can be printed in a PDF format and then used in other programs after geo-referencing.

The acronyms used in the compilations are the abbreviations for the Austrian provinces and AUT for data of the entire area of Austria.

AUT	<a href="http://www.geoland.at/geo_webgis3/init.aspx?karte=geo_31287&amp;ks=ks_geo">http://www.geoland.at/geo_webgis3/init.aspx?karte=geo_31287&amp;ks=ks_geo</a> <a href="http://www.basemap.at">http://www.basemap.at</a>
W	<a href="http://www.wien.gv.at/ma41datenviewer/public/start.aspx">http://www.wien.gv.at/ma41datenviewer/public/start.aspx</a> <a href="http://www.wien.gv.at/stadtplan/">http://www.wien.gv.at/stadtplan/</a>
NÖ	<a href="http://atlas.noel.gv.at/">http://atlas.noel.gv.at/</a>
OÖ	<a href="http://maps.doris.at/">http://maps.doris.at/</a>
S	<a href="http://www.salzburg.gv.at/gisonline/(S(0a5jib552wkdjcndex2pwc45))/init.aspx?karte=kompakt">http://www.salzburg.gv.at/gisonline/(S(0a5jib552wkdjcndex2pwc45))/init.aspx?karte=kompakt</a>
T	<a href="https://portal.tirol.gv.at/mapAccelWeb/ClientServlet?CMD=Init&amp;VIEWID=-139&amp;MAPWIDTH=807&amp;MAPHEIGHT=569">https://portal.tirol.gv.at/mapAccelWeb/ClientServlet?CMD=Init&amp;VIEWID=-139&amp;MAPWIDTH=807&amp;MAPHEIGHT=569</a>
V	<a href="http://www.vorarlberg.at/atlas">http://www.vorarlberg.at/atlas</a>
K	<a href="http://gis.ktn.gv.at/atlas/init.aspx?karte=atlas_basiskarten&amp;ks=kaernten_atlas">http://gis.ktn.gv.at/atlas/init.aspx?karte=atlas_basiskarten&amp;ks=kaernten_atlas</a>
St	<a href="http://gis2.stmk.gv.at/atlas/init.aspx?ks=das&amp;Karte=adr&amp;cms=da">http://gis2.stmk.gv.at/atlas/init.aspx?ks=das&amp;Karte=adr&amp;cms=da</a>
B	<a href="http://gis.bglld.gv.at/WebApp/Kataster">http://gis.bglld.gv.at/WebApp/Kataster</a>

**Table 2.** Links to Internet Atlas Portals (accessed 15 April 2013).

### 3.2. Orthophoto Images

Orthophoto images have been used already for a long time to produce orienteering maps, in the beginning as a hardcopy, in the time as data began to be affordable as digital data. In the age of Google Earth, everyone can use orthophoto or satellite images, but without any geo-reference. These geo-referenced data are provided by the province administrations in different resolutions, some provinces deliver their data in a sheet line system, in other provinces the area can be defined by an arbitrary rectangle.

Optional to the geo-data of the provinces, the Agricultural, Forestry and Hydrological Data Center (LFRZ) offers high resolution orthophoto images of the entire area of Austria.

*Table 3* gives an overview of the costs and the resolutions of the orthophoto images provided by the provinces and the LFRZ.

	Costs / km <sup>2</sup>	Resolution	Comment
AUT	€ 15.- € 6.- € 1.-	0,1 - 0,15 m 0,2 - 0,25 m 1 m	LFRZ ( <a href="http://www.geoimage.at">http://www.geoimage.at</a> )
W	€ 16,89.- € 1,52.- € 0,38.-	0,15 m 0,5 m 1m	€ 0,38.- / 1 Million Pixels
NÖ	€ 15.- € 8.-	0,125 m 0,2 m	
OÖ	€ 6.- € 3.-	0,2 m 1,0 m	
S	€ 18.- € 7,20.-	0,125 m 0,25 m	Sheet Line System 1:5000 (2,5 km x 2,5 km)
T	€ 6.- € 3.-	0,2/0,25 m 0,5 m	
V	€ 18.- € 7,20.- € 1,20.-	0,125 m 0,25 m 1,0 m	
K	€ 6.-	0,20 m	Sheet Line System 1:2000 (1,25 km <sup>2</sup> )
St	€ 6.-	0,20 m	Sheet Line System 1:2000 (1,25 km <sup>2</sup> )
B	€ 10,80.-	0,25 m	

**Table 3.** Costs and Resolutions of Orthophoto Images (accessed 15 April 2013).

Orthophoto images are also available as a WMS service for free, Vorarlberg (with a resolution of 0,125 m) and Burgenland provide this service directly, while the service from the LFRZ (with a resolution of 2 m) could only be used after a free registration on their homepage. The city of Vienna offers the orthophoto images via WMTS service that cannot be used directly in OCAD.

[http://vogis.cnv.at/mapserver/mapserv?map=i\\_luftbilder\\_r\\_wms.map&version=1.1.1](http://vogis.cnv.at/mapserver/mapserv?map=i_luftbilder_r_wms.map&version=1.1.1)

<http://gis.bglld.gv.at/GISBgld/services/Public/Orthofoto/MapServer/WMS/Server>

<http://gis.lebensministerium.at/wmsgw/dopmaxresfree/?>

<http://data.wien.gv.at/formate/geoweb services.html#wmts>

(All hyperlinks accessed 15 April 2013)

### 3.3. Digital Elevation Models (DEM)

Since OCAD is offering an import filter for DEM data, the data can be used directly to derive contour lines and shading. The DEM data offered by the province administrations are mainly data from Airborne Laser Scanning campaigns. These data are available in different file formats or can be provided in a special desired format, for this purpose some extra costs will be charged.

*Table 4* gives an overview of the costs and the resolutions primary for the Digital Terrain Model (DTM), sometimes the province administration offers also a combination rebate for an additional Digital Situation Model (DSM) and contour lines and relief shading.

	Costs / km²	Resolution	Comment
W	€ 135,20.-		DTM, all Raster or Vector Formats, independent of the Resolution
NÖ	€ 77.-	1 m	DTM or DSM
	€ 33.-	5 m	DTM or DSM
	€ 84.-	1 m	DTM and DSM
OÖ	€ 100.-	0,5 / 1 m	DTM or DSM
	€ 75.-	2 m	DTM or DSM
	€ 120.-	0,5 / 1 m	DTM and DSM
S	€ 65.-	1 m	DTM or DSM
	€ 117.-	1 m	DTM and DSM
T	€ 120.-	1 m	DTM and DSM, incl. 1 m Contour Lines and Shading
V	€ 100.-	1 m	DTM and DSM, incl. 1 m Contour Lines and Shading
	€ 10.-	5 m	DTM and DSM, incl. Shading
	€ 5.-	10 m	DTM and DSM, incl. Shading
K	€ 100.-	1 m	Sheet Line System 1:5000 (2,5 km x 2,5 km) DTM and DSM
	€ 10.-	5 m	
	€ 5.-	10 m	
St	€ 80.-	1 m	DTM or DSM
	€ 100.-	1 m	DTM and DSM
B	€ 120.-	1 m	DTM

**Table 4.** Costs and Resolutions of DEM Data (accessed 15 April 2013).

The province administration of Tyrol offers a free download of DEM data with a resolution of 10 m in an ArcInfo ASCII-Grid format (Download possible from the homepage of the Tyrolean GIS department or the homepage

of the OGD, see the link below) together with a relief shading (WMS service, see the link in *Section 3.4*). The city of Vienna has also a DEM as a WFS service with a resolution of 5 m for free.

<http://data.gv.at>

<http://data.wien.gv.at/daten/geoserver/wfs>

(All hyperlinks accessed 15 April 2013)

### 3.4. Contour Lines

The contour lines provided by the province administrations are derived from the DTM. *Table 5* gives an overview of the costs and the equidistance of the contour lines and the prices of additional products.

	Costs / km <sup>2</sup>	Equidistance	Comment
W	€ 135,20.-	1 m	Shading € 3,255.- / km <sup>2</sup> (Resolution 1 m)
NÖ	€ 40.-	1 m	Shading € 4.- / km <sup>2</sup> (Resolution 1 m)
OÖ	€ 100.-	0,25 m	derived from DTM 1 m
	€ 10.-	1 m	derived from DTM 5 m
S	€ 50.-	1 m	Shading € 7,5.- / km <sup>2</sup>
T	€ 100.-	1 m	incl. Shading
V	€ 30.-	1 m	
K	€ 40.-	1 m	Sheet Line System 1:5000 (2,5 km x 2,5 km)
	(€ 250.- / Sheet) € 100.- (€ 31,25.- / Sheet)	1 m	Sheet Line System 1:1000 (625 m x 500 m)
St			not available
B			not available, only by request

**Table 5.** Costs and Resolutions of Contour Lines (accessed 15 April 2013).

The province Tyrol offer a free relief shade with a resolution of 1 m as a WMS service, while Vorarlberg provides additionally contour lines with an equidistance of 5 m.

[http://gis.tirol.gv.at/wms/hillshades\\_wms\\_tirol](http://gis.tirol.gv.at/wms/hillshades_wms_tirol)

[http://vogis.cnv.at/mapserver/mapserv?map=i\\_hoehenschichten\\_v\\_wms.map&version=1.1.1](http://vogis.cnv.at/mapserver/mapserv?map=i_hoehenschichten_v_wms.map&version=1.1.1)

[http://vogis.cnv.at/mapserver/mapserv?map=i\\_relief\\_r\\_wms.map&version=1.1.1](http://vogis.cnv.at/mapserver/mapserv?map=i_relief_r_wms.map&version=1.1.1) (All hyperlinks accessed 15 April 2013)

### 3.5. Additional Costs

Beside the cost depending on the area of the data, some additional costs are charged by the province administrations. *Table 6* gives an overview of these costs, some are charged per order and others as a minimum fee of trading.

W	€ 38.-
NÖ	€ 25.-
OÖ	€ 60.-
S	
T	Minimum € 20.-
V	Minimum € 50. -
K	€ 40.-
St	Minimum € 25.-
B	Minimum € 300.-

**Table 6.** Additional Costs (accessed 15 April 2013).

### 3.6. Miscellaneous Data

Some of the province administrations offer free data in the context of OGD that might be also interesting or useful for producing orienteering maps. The administration of Vienna for instance has a large list of data offered by WFS, WMS or WMTS services, especially the city base map or the land utilization plan. From Burgenland the real estates as well as the land utilization plan from Vorarlberg can be loaded as a WMS service. Different base maps (Schmidt et. al. 2012) from the entire area of Austria are available as a WMTS service.

<http://data.wien.gv.at/daten/geoserver/wfs>

<http://data.wien.gv.at/daten/wms>

<http://data.wien.gv.at/formate/geoweb services.html#wmts>

<http://gis.bgl.d.gv.at/GISBgl.d/services/Public/Grundstuecke/MapServer/WMSServer>

[http://vogis.cnv.at/mapserver/mapserv?map=i\\_flaechenwidmung\\_v\\_wms.map&version=1.1.1](http://vogis.cnv.at/mapserver/mapserv?map=i_flaechenwidmung_v_wms.map&version=1.1.1)

<http://www.basemap.at> (for further information to the WMTS link)

(All hyperlinks accessed 15 April 2013)



## 4. Conclusion

While the number of data offered by the province administrations is increasing, the costs of these data are decreasing or the data are due to the open data initiative even for free. After consulting the contact persons of the GIS departments of the province administrations, high resolution data for the production of orienteering maps can sometimes be obtained in the context of sport sponsoring without any charge.

The development and improvement of the used programs have also contributed to a broader application of geo-data that improved the quality and reduced the time for the production of orienteering maps. Nevertheless, the use of high resolution data can not displace the survey but it makes it more efficiently.

## References

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